

## **CIRA/CSU Information about Ongoing Research with NOAA OAR, NESDIS and NWS**

**Prepared by Prof. T. H. Vonder Haar, Director  
and Ms. Mary McInnis-Efaw, Manager  
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[Note: Following answers to your base questions, we also add as requested three “Research Success Stories” wherein CIRA has partnered with NOAA research in some major additions to NOAA’s support for its clients.]

### **1. CIRA’s History:**

The Cooperative Institute for Research in the Atmosphere was formed in 1980 between the National Oceanic and Atmospheric Administration (NOAA) and Colorado State University (CSU) to increase the effectiveness of atmospheric research. CIRA was the seventh joint institute established with major research universities. In 1980, Thomas H. Vonder Haar (then Atmospheric Science Department Head) made the arrangements in collaboration with CSU faculty members, administrators, and NOAA officials. Almost immediately, a 6-person branch of NESDIS research moved into CIRA. Previous interactions with nearby NOAA labs also increased.

### **CIRA’s Mission:**

The Mission of the Institute is to conduct research in the atmospheric sciences of mutual benefit to NOAA, the University, the State and the Nation. The Institute strives to provide a center for cooperation in specified research program areas by scientists, staff and students, and to enhance the training of atmospheric scientists. Special effort is directed toward the transition of research results into practical applications in the weather and climate areas. In addition, multidisciplinary research programs are emphasized, and all university and NOAA organizational elements are invited to participate in CIRA’s atmospheric research programs.

The Institute’s research is concentrated in several theme areas that include global and regional climate, local and mesoscale weather forecasting and evaluation, applied cloud physics, applications of satellite observations, air quality and visibility, and societal and economic impacts, along with cross-cutting research areas of numerical modeling and education, training and outreach. In addition to CIRA’s relationship with NOAA, the National Park Service also has an ongoing cooperation in air quality and visibility research that involves scientists from numerous disciplines, and the Center for Geosciences/Atmospheric Research based at CIRA is a long-term program sponsored by the Department of Defense.

### **2. Total amount of NOAA funding in the last full year: July 02-June 03: \$8,043,589**

**2.A. to be answered by MASC, DOC, Boulder, CO**

#### **2.B. CIRA’s Research Themes**

**a. Global and Regional Climate Studies**

- b. Local and Mesoscale Area Weather Forecasting and Evaluation
- c. Cloud Physics
- d. Applications of Satellite Observations
- e. Air Quality and Visibility
- f. Societal and Economic Impacts
- g. Numerical Modeling (Cross-cutting Area)
- h. Education, Training, and Outreach (Cross-cutting Area)

2.C. In regard to the short, medium and long-term nature of NOAA research with CIRA, we note that such subdivisions can be made according to several criteria. We have chosen to focus on the objective impacts of the research as the primary factor.

Please note that a considerable amount of our research with NOAA involves “low-hanging fruit” derived from the basic research in atmospheric-related projects at the Atmospheric Science Department at CSU. Obviously, one of the principle reasons for NOAA’s CIRA at CSU is the top quality Atmospheric Science Department. The CIRA transition of this research to NOAA is short term- yet it follows from a foundation of other research often sponsored by other agencies.

According to NOAA’s needs and plans, CIRA also initiates and collaborates on short (<2 years), medium (2-5 years), and long-term (>5 years) research. Some ongoing CIRA research supports NOAA NESDIS and OAR development of new, major observing systems such as NPOESS, GOES-R, GUPS, etc. While these new systems may not be operating for 5-10 years (according to the NOAA plans) some of CIRA’s research related to them will provide relatively short-term information to guide NOAA’s options along the way to the long-term application.

Furthermore, CIRA climate research with OAR (OGP) may produce both mid-term results used by NOAA in national and international climate “assessments,” as well as long-term understanding/forecasting of climate events.

For all the reasons above, we classify the temporal nature of CIRA’s research into ranges- not absolute values. They are:

< 2 years	35-55%
2-5 years	30-50%
> 5 years	0-10%

2.D. The geographic scope of CIRA’s research spans the spectrum from local and regional to national and global.

CIRA-ingested and archived global satellite coverage provides data support for research in any area or geographic domain of the globe. An example is our tropical cyclone research that benefits from our use of all of the current

functioning geostationary satellites. CIRA also has a long history of contributions to climate understanding at both global and regional scales. Ongoing climate monitoring projects with NOAA such as the major observational and analysis input to the ISCCP with OAR, OGP, NESDIS, and NCDC are internationally recognized via the World Climate Research Programme.

Our research is also regional (Great Lakes snow, coastal stratus, New England temperature and air quality field experiments, International H<sub>2</sub>O Project over the Southern Plains, fire weather support over the Rocky Mountain and Far West regions, coral bleaching around the Great Barrier Reef), national (Rapid Update Cycle and WRF model development/enhancements), and local (modernization of WFOs through advanced technology, techniques and training to improve nowcasting and severe weather forecasts/warnings) in scope. In addition, the majority of our research efforts involve weather phenomena such as thin cirrus detection, atmospheric moisture detection, and mid level cloud icing, along with improved satellite data assimilation techniques, that have local, regional, national, and global analysis and forecast implications.

3. The percent of the total Joint Institute funding coming from NOAA is 68% for FY 2002-2003. (This percentage has been consistent over the years).

4. CIRA brings much unique expertise to NOAA:

- a. Associated with a world-class Atmospheric Science Department at CSU. The faculty has many disciplines (satellite remote sensing, dynamics, climatology, modeling, data assimilation, and aerosol chemistry) that can be smoothly entrained into NOAA-relevant research.
- b. A long-standing, multi-disciplinary research agenda supported by many other CSU departments such as Civil Engineering, Electrical Engineering, Physics, Sociology, Statistics, and Economics.
- c. Our satellite earth station and archival system provides an extremely low-cost, fully automated capture of geostationary and polar satellite sensor data. Our current archive contains 8 terabytes of satellite sensor data dating back to 1980's.
- d. Long-standing, daily collaboration with FSL, ETL, and WDC that facilitate technology transition to NWS, NESDIS and other NOAA organizations; these close collaborative interactions also provide CIRA researchers a better understanding of NOAA's technical and scientific needs.
- e. A long-standing research support activity with the DoD. Our Center for Geosciences supports DoD-relevant research but more importantly, is able to share skills and research costs (including infrastructure) in the many research areas of mutual interest to the DoD and NOAA. The many examples of dual-use application offer tremendous leveraging potential.

- f. As the CloudSat Data Processing Center, the approximately 26 gigabytes of data and 52 gigabytes of products we will ingest and produce per day should provide another excellent opportunity for leveraging and research collaboration with NOAA.
- g. Our collaborative partnership with the National Park Service on air quality research also provides natural opportunities for “spin-off” applications in hazardous diffusion/dispersion research in support of Homeland Security.
- h. Education and mentoring of CSU graduate students and CIRA postdocs on many occasions lead to their career alignment and participation in NOAA research.
- i. CIRA-developed wavelet transform-based data compression technique is the heart of the operational FX-Net PC workstation implemented by FSL to support university meteorology teaching labs, NWS regional headquarters (in support of remote WFOs), the New England AIRMAP air quality program, and the National Interagency Fire Weather Center.
- j. As the incumbent Systems group for the international GLOBE K-12 science and education program, the 9-member CIRA research team designed, developed and maintains the interactive website, real-time data acquisition, and the central database. Now numbering 106 countries, over 14,000 schools worldwide, and over 11 million measurements, the GLOBE Program was identified as one effort that should continue to be supported as an element of the Earth Observation Summit to help broaden awareness and interest in the environment in the most recent draft US position paper being prepared for the third Summit.

5. The following is a breakdown of staff funded by NOAA- includes only staff who receive 50% or more of their funding from NOAA.

At the end of FY 02-03:

- a. Manager- 1
- b. Administrative Assistants- 2
- c. Research Coordinator- 1
- d. Postdocs- 11
- e. Research Scientists (Ph.D.)- 11
- f. Research Associates- 50

## **Success Stories in Research**

CIRA and NOAA partners have reported many research-to-user application and research-to-user information success stories during the last 20 years. Three major examples are:

1. Satellite imagery from geostationary satellites is now an integral part of daily economic, recreational and personal life in the U.S. Whether the satellite images are viewed from a media outlet, the Internet or at a NOAA, FAA, etc workstation, the quality and dependability of the imagery is a result of CIRA and NESDIS collaborative research.
2. The modern-day forecasting tools available to our National Weather Service forecasters- contained in the AWIPS System- are the envy of forecasters and nations around the world. Much of the early design and the final software system were produced by OAR's Forecast Systems Laboratory. It took more than 10 years of cutting-edge research and technology among a "troika" of OAR (FSL), NESDIS and NWS- with 2-3 University Joint Institutes including CIRA- to complete this project central to NOAA's mission.
3. For more than 20 years, NOAA's Office of Global Programs (of OAR) and its predecessor programs have supported two key portions of the World Climate Research Programme's International Satellite Cloud Climatology Project (ISCCP). This global data collection and analysis project has been a) a major U.S. Commitment to the WCRP via the WMO of the UN; b) been a true, long-term research partnership with NASA; and c) contributed to more than 200 science publications and assessments of cloud conditions important to Earth's climate. CIRA has been a major partner with NOAA's ISCCP since 1983.

These three examples remind us that NOAA research with its Labs and Joint Institutes is capable of sustained, focused research to meet national goals. This capability should be an integral part of NOAA's research of the future.